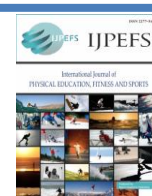




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## Effectiveness of plyometric exercises to improve muscular strength and digital achievement for students in shot put

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**Abstract:** To identify the effectiveness of plyometric exercises to improve muscular strength and achievement in shot put event by students (20-22 years old). The researchers used an experimental method; the sample was formed by students belonging to the institute of physical education & sports, University of Mostaganem (Algeria). Thus it was the application of the experimental method was applied on a sample of third-year students (males) of 45 students divided into two groups, first control group of 22 students and an experimental group of 23 students. While the tests used were (strength test, achievement test). After the treatment of the results by statistical means, and through these results it have been reached several conclusions of them, plyometric Exercises to develop muscular strength and achievement in shot put [discussion significant difference ( $*p \leq 0.05$ )]. And best improve of the experimental sample based on plyometric exercises compared to the control sample, which rely more on the technical side only in shot put event.

**Key Words:** plyometric exercises, explosive strength, Digital achievement, shot put



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## 1. Introduction

The shot put is one of the four throwing events in regular track and field competitions, along with the discus throw, hammer throw and javelin. The effectiveness of the chucking part of the activities of the field, where it is divided to several sports such as (discus, javelin, shot put, hammer throw) and the need for the various components of fitness and different proportions among them according to the type of competition. It's also has the effectiveness of the shot put among terms of reference of athletics which are related to body movement of the body and its ability to deliver dynamic tool aimed at or push or to become a distance from it is the ability of an individual to performance motor [1]. The Performance in athletics depends on muscle power production, where muscle strength is the product of strength and speed, and thus, any of these components, or both need to be developed within the training programs for the development of muscle strength and thus the level of performance [2-5].

This refers to inability to show muscular strength affects to develop performance skills and lack of access to sports to access. In addition to the role of flexibility and agility in the possibility of taking the body to track the correct motor from the beginning of the transaction to the end, where a lack of fitness component to give aesthetic movement in performance, development flexibility particularly in the spine and shoulders makes it easy to bind and transition which appears through rhythm weighted performance of the movement [6].

During the traditional programs is increased muscle strength for a muscle without training similar movements for the technical performance, while functional drills include several muscle groups and joints for both parties, "top and bottom" as well being used alternative options within training assistance ways to improve the technical performance compared to traditional methods, and it fits with all ages and contribute to the improvement of all physical abilities, where they increase and enhance the muscles strength endurance, motor balance, agility, where lead full motor joints term [7].

For strength and conditioning, or for performance enhancement, plyometric exercise should play an integral part of the program. Therefore, it is often suggested that a strength program should initiate a plyometrics [8]. Where Plyometrics training was introduced to differences disciplines sports to improve speed and strength and produce power [9]. Plyometric exercise has been defined as activities that empower a muscle to reach maximal force in the shortest possible time [10].

Complementing the findings of other researchers who have reported that plyometric exercise may increase peak force [11] and power production during rapid movements [12, 13]. Some experts also indicates that The importance of plyometric to a strength and conditioning program has previously been established, with positive training adaptations reported for force production, muscular power [14-18].

As mentioned above, the problem of research was due to the follow-up of researchers in the field of teaching students in the disciplines of athletics in the physical education and sports institutes, where the weakness of students was observed in the physical level and digital level, and the lack of the use of appropriate training methods on the physical side, which has a direct impact on digital achievement, therefore , the researchers are using some plyometric exercises and their impact on muscular strength and digital achievement in shot put of third-year students' in the physical education and sports institute , University of Mostaganem-Algeria.

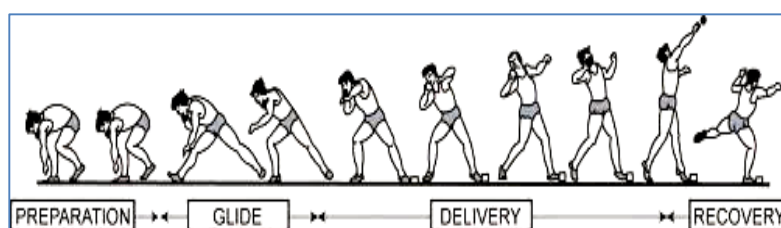
## 2. Methods

The study follows the experimental method, using the program and pre-test and post-test results. Search community were selected from third-year students physical education and sports, Institute of physical education and sports of Mostaganem (Algeria), 60 students ranging in age between 20 to 22 years of the school year 2017/2018. Also, 45 students were chosen from males and were divided into two groups as follows: Group one is the experimental group (23 students), and the second group is the control group (22 students) from the third-year of physical education and sport.

## 2.1 Experience

We have been conducting training in the mornings (Monday and Wednesday) is the usual times for sample research and training has been the preparation of a set of physical exercises (plyometric exercises) proposed and adopted in the quality modules in order to develop the muscular strength and its contribution to improving digital level in shot put activity for students of physical education and sports (Figure 1).

The tribal tests were conducted on sample experimental and control sample on December, 13<sup>th</sup> 2017. It was suggested that 16 training session containing a set of plyometric exercises proposed for shot put activity from January, 10<sup>th</sup> 2018 to March, 05<sup>th</sup> 2018. The sample control, examine the effectiveness of the shot put under supervisor. Either remote tests were in the same conditions and at the same time



**Figure 1.** Achievement in shot put

**Table 1** The results of the tribal and remote tests of the experimental sample (n1 = 23)

Statistical measurements	Post-test	Pre-test	T	T	Statistical
Tests	Means± SD	Means± SD	Tabular	Calculated	significance
Muscular strength test	8.31±0.61	8.83±0.69	2.57*	1.71	Significant
Achievement test	9.86±0.87	10.65±0.89	3.04*		Significant

**Table 2** The results of the tribal and remote tests of the control sample (n<sub>2</sub>=22)

Statistical measurements	Post-test	Pre-test	T	T	Statistical
Tests	Means± SD	Means± SD	Tabular	Calculated	significance
Muscular strength test	8.16±0.9	8.34±0.81	2.00*	1.71	Significant
Achievement test	9.53±1.03	10.12±1.01	2.12*		Significant

**Table 3** Compare the results after tests between experimental and control samples

Statistical measurements	Control sample	Experimental Sample	T	T	Statistical
Tests	Means± SD	Means± SD	Tabular	Calculated	significance
Muscular strength test	8.34±0.81	8.83±0.69	2.27*	1.69	Significant
Achievement test	10.12±1.01	10.65±0.89	1.83*		Significant

## 2.2 Used tests

- ✓ Test of push the medicine ball (4 kg) (m)
- ✓ Achievement in shot put test (6kg) (m) and using the same methods or tests were conducted in March, 07<sup>th</sup> 2018.

## 2.2 Data analysis

The statistical data were analyzed with the use of descriptive statistical indices [mean  $\pm$  standard deviation (SD)]. The mean and standard deviation were calculated with the measured results, paired T-test was applied for mean difference test between groups and T for one group. Statistical significant level was set at  $\alpha=0.05$ .

## 3. Results

Through the statistical results mentioned in value estimated to 1.71 at the degree of freedom 22 and significant level 0.05 which means the existence of statistical significance table (01), we notice that the calculated T values for the experimental sample amounted to (2.57 and 3.04) which is larger than the tabulated T which means also the existence of significant difference between the pre-test and post-test calculated average in favor of the post-test.

Through the statistical results mentioned in table (02), we notice that the calculated T values for the control sample amounted to (2.00 and 2.12) which is larger than the tabulated T value estimated to 1.71 at the degree of freedom 21, level of indication 0.05 which the differences between the averages of any differences between the averages of statistical significance.

Illustrated by table (03) above all values T calculated that come between 1.83 as the smallest value and 2.27 as the largest value is greater than the value of T tabular which reached 1.69 at degree freedom  $(n_1+n_2-2)=43$ , level of indication 0.05 which the differences between the averages of any differences between the averages of statistical significance.

## 4. Discussion

Depending on the statistically processing, In the experimental sample, this result indicates that Table (01), there are significant statistical differences

in the pre-test and post-test in the experimental sample in the muscular strength and digital achievement in shot put event. According to the researchers this results was the results of the proposed training program based on scientific foundations of the application of physical exercises of quality that are related to the game, especially the use of the plyometric exercises [08 weeks & 02 times in one week].

As recommended by some studies such as the study Hassan Ibrahim (2001) and Judge L.W (2007), on the special attention to elements of physical performance, especially the power of quick explosiveness and strength through diversification in using muscle strengthening exercises to improve achievement [18].

This is confirmed by the importance of the development of physical capacity for digital achievement in the competition, that muscle power firm linked to some of the components installed for fitness as the capacity required by the nature of the performance in competitions of throwing [19].

Researchers adds that plyometric exercises used for the benefit of the experimental sample led to development of muscular power through the development of muscle contraction and the development of the relationship between maximum power and muscular strength in the arms and legs clear impact to achieve the feat in the shot put. This is indicated by previous studies, that muscular power is the product of force and velocity, thus, either of these components or both of them, needs to be addressed in a training program in order to develop muscular power [20], and therefore development of performance level [21-24].

Researchers see an improvement in digital level with students due to the use quality of physical exercises that have had a positive impact on it, and this is consistent with some previous studies that confirmed to the development of physical abilities and adoption of the most appropriate training methods and choose physical special exercises Associated with the type of effectiveness [5, 23,26]. In the table (03) shows that there are statistically significant differences in post-test between control and experimental sample in favor of the experimental sample, this result indicates that plyometric exercises was more effective in



improving performance in the shot putting, through the use of medical balls and iron balls with different weights, this actually confirms the effectiveness of using plyometric exercises with the students led to an improvement in the physical abilities and performance in sports activities [27-29].

Finally through the presentation of the previous results, researchers find the need to adopt modern methods of training such as weight training method, ballistic training, strength training, plyometrics training, as well as special physical exercises for the type of efficiency or specialty sports to develop achievements.

## 5. Conclusions

The program of plyometric exercises used has a positive impact on the development of muscular strength in shot put event. The program of plyometric exercises has a positive effect on digital achievement in shot put. The development of muscular strength has a positive effect on digital level in shot put. Best improve of the experimental sample based on plyometric exercises process compared to the control sample, which rely more on the technical side only in shot put activity.

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